

General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.
- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

NASA TT F-12,501

A NEW CASE OF DIABETES INSIPIDUS WITH POLYDIPSIA.
STUDY OF THIRST.M. Raoul and Madame Simonne Kourilsky,
Messrs. Jacques Sicard and Jean-Jacques Galey.Translation of "Une Nouvelle Observation de
Diabete Insipide a Precession Polydipsique.
Etude de la Soif," Societe Medicale des Hopitaux,
Bulletin et Memoires, Vol. 58, pp. 115-121, 1942.

FACILITY FORM 502

N69-36995 (THRU)

9 (PAGES)

✓ (NASA CR OR TMX OR AD NUMBER)

04 (CATEGORY)

A NEW CASE OF DIABETES INSIPIDUS WITH POLYDIPSIA.
STUDY OF THIRST.

M. Raoul and Madame S. Kourilsky,
Messrs. J. Sicard and J. J. Galey.

ABSTRACT: A considerable diabetes insipidus (18l/day) developed in a 22-year-old girl, reacting perfectly to hypophysial extract, plus an adeposo-genital syndrome and a weight gain of 26 kg in one after a cranial traumatism. The role of thirst is examined.

In a series of physio-pathological investigations devoted to a syphilitic diabetes insipidus with polydipsia, we have evolved the leading idea that thirst played a role of prime importance in human diabetes insipidus, a role which has been disregarded in these last years because the malady was conceived of as a primitive polyuria [1]. /115*

Since 1938, the date on which we began the study of our first woman patient, other observations have confirmed us in this line of thought, thus bringing new proofs to our thesis, either that polydipsic precession could have been explicitly ascertained, or that the physio-pathological study of sick persons suffering from diabetes insipidus, in whom this precession does not appear, demonstrates that all the biological modifications which have been established result uniquely from excessive ingestion of water.

The case which is going to follow is in the first group. Thirst having been the first factor to date. /116

This physio-pathological study was able to be pursued only in a very fragmentary way, because of the indiscipline of the patient who objected to prolonged hospitalization, but the clinical study of thirst was able to be carefully done and furnishes interesting data on the importance of this symptom.

Miss Peyr ..., thirty-four years of age, was examined for a diabetes insipidus from which she had been suffering for thirteen years.

In July 1928, the patient, then twenty-two years old, was struck by a metallic sphere which weighed 3 Kilograms and which fell from a height of 1 meter on her right parieto-frontal region. She felt this blow as considerably violent, felt stunned, did not however lose consciousness, gave evidence neither of epistaxis, nor of otorrhea. But her discomfort persisted on the following days, together with a persistent and violent headache, and a massive hematoma, frontal and on both sides of the eyelids, appeared and it persisted for a month. The patient rested, did not call for a doctor, then at the end of ten days, feeling better, returned to usual work, without any desire of submitting to any further examination.

*Numbers in the margin indicate pagination in the foreign text.

In the following year, she felt tired and very weary. She did not complain of headaches, but she experienced a feeling of unsteadiness and she often stumbled. In spite of these symptoms she continued to attend her usual work. However, without being able to precisely state what her discomfort exactly consisted of, she said, "she did not feel like before"; she became restless, irritable and strange.

In July 1929, a year to the day after the accident, a day of considerable heat, in the course of a meal, she was suddenly seized with an unquenchable thirst. Abruptly she dashed forth for a bottle of beer and she drained it in a gulp; to the remarks of amusement on the part of her guests, she replied that she was still thirsty and more and more so: she sent for additional beverages which did not quench her thirst; the need to drink persisted after the meal, during the entire day; so much so that in twenty-four hours the patient had drunk close to 10 liters.

Polyuria developed after her thirst: about one hour later, according to the patient. Once established the polydipsia-polyuria cycle continued, the patient drank up to 18 liters and urinated up to 20 liters. She urinated more than she drank.

She described the sensation that she felt as an irresistible need. If this need was not satisfied immediately, she experienced an intense feeling of dryness in her mouth, in her esophagus and she felt the effects of it down to the epigastric cavity; the dryness was accompanied by a compression and constriction and by a "shriveling" of the initial digestive organs. Her tongue was not always externally dry in proportion to the sensation experienced by the patient. Gustatory perception of water was then altered: water had no taste; in order for her to feel that her thirst had been quenched, the patient had to ingest iced water, even in winter, or warm and alcoholized liquids, but then the result was less.

The need to "feel what she was drinking" caused her for a time to add alcohol or wine to beverages in such a regular fashion that she felt that she was becoming ethylic and on her own she gave up this practice; not without a struggle, she resolved to drink only very cold water.

If her thirst was long in being satisfied, the patient was irritated and became very agitated, "I'm getting to be like a mad woman"; however, she experienced neither nausea nor vomiting.

Her appetite completely disappeared: "Food does not interest me, she said, I think only about drinking". Because of that, her food intake became very restricted; and those in her company were concerned to see her eat so little. At times, she was really anorectic and withdrew in the face of solid foods. She did not willingly eat salted foods and little by little she lost the habit of taking salt, because she noticed that in this way she was less thirsty.

In spite of this restriction, the patient was surprised to see that her

weight did not lessen; on the contrary, it increased by 1 Kilogram a month, /117 then more rapidly still, the patient went in two and a half years from 42 to 78 Kilograms, acquiring an enormous increase of 26 Kilograms.

It was not solely a matter of water retention, but it concerned the development of a typical hypophysical obesity forming a part of adiposogenital syndrome; a complete amenorrhea set in for six years.

Finally, in spite of such a considerable corpulence that the abdominal wall and flanks were covered with stria, fatigue was extreme; the patient became aware of changes in her psychism: she was a depressed "neurasthenic" according to her own expression; she cried without reason, also laughed sometimes without reason; she was unstable, irritable, shut herself up alone and did not want to see anyone for days. She was very concerned by the loss of her hair and by an irregular temperature, below normal; very nervous, she complained of tremors in the extremities of her body, which interfered with her profession as milliner.

No precise neurological sign came to light: neither violent and persistent headache, nor hemianopsia; the patient however complained of a condition of amblyopia together with intermittent diplopia, but she complained above all of a partial bilateral deafness in the two years which followed the traumatism.

For six years, the patient treated herself in her own way without any result, attempting above all to reduce her obesity. So she discovered dinitrophenol which, at a dose of 8 tablets a day, caused an extremely abundant perspiration with profuse sweating, especially at night, drenching the bed sheets. Each time this happened, the patient lost weight; with a dose under 8 tablets (or 0 to 288 grams), sudation did not occur.

The patient continued with this dose for ten to twelve days, stopped for fifteen days, then resumed the dosage on her own authority and declared that she had succeeded in losing 15 Kilograms through this method and in stabilizing her weight at 52 Kilograms by inducing sudation as soon as her weight became excessive. She got into the habit, on the other hand, of eating very little salted and very little sugared foods.

Asked whether she knew if her thirst was any less during these cases of profuse sudations, she was unable to state it precisely; it seemed to her that there was not any change. On the other hand, at night time, her thirst was in a general sort of way less excessive than during the day.

By accident in her personal therapeutic investigations, she discovered the action of pilocarpine, by utilizing a patent medicine which contained extract of jaborandi and magnesium chloride. This extract is active only in a large dose and causes a very heavy sudation and a very considerable perspiration, but the effect lasts for only an hour. Thirst reappears as very intense two hours after ingestion of the medication. It is not influenced by profuse sudation.

In 1934, the patient finally decided to consult with a doctor and an extract of hypophysial posterior lobe was prescribed which transformed her existence: 4 to 5 nasal doses a day equilibrated polydipsia and polyuria, at 2 liters 500 or 3 liters a day.

Her thirst became tolerable especially in the morning before breakfast, but she underwent a very definite fresh outbreak soon after her meals, when ingestion of 700 to 800 cubic centimeters of a liquid in a single draft became necessary.

Her amenorrhea was treated with intramuscular injections of fulliculin successfully at the end of six months. With the return of the menses which were not profuse, the patient discovered that with each menstrual period she experienced a fresh outbreak of thirst.

Examination. - When we examined her in 1941, the patient weighed 57 Kilograms. Although slim in her exterior appearance, when she was undressed, she showed the appearance of a small adiposogenital syndrome. No neurological sign was detectable; no hemianopsia, the lower area of eye normal (Dr. Voisin), no attack of the eighth nerve (auditory nerve) VIIIth pair. The deafness and diplopia had in the interim retroceded, according to the patient. Her thirst was still imperious, at times, in spite of 2 to 3 doses of hypophysial extract; the polyuria condition was limited to 3,500 to 4,000 cubic centimeters per twenty-four hours.

The solid constants, measured several hours after a dose of pituitrin, /118 by M. Laudat, are as follows:

Residue fixed at 100° (serum).....	90 gr	42
Mineral materials (chlorides included).....	8 gr	28
Molecular concentration (cryoscopic point).....	0°	56
Protides: 71 gr 82 (Serine.....)	48 gr	66
(Globulin.....)	23 gr	16
(Ratio $\frac{S}{G}$)		2.10
Lipides.....	9 gr	45
Total Cholesterol.....	3 gr	12
Urea.....	0 gr	45
Plasmatic chlorine.....	3 gr	60
Globular chlorine.....	1 gr	91
Ratio $\frac{\text{Plasmatic chlorine}}{\text{Globular chlorine}}$		0.53

In urines, chlorinated excretion in twenty-four hours is normal as the table below indicates.

Dates	Volumes in Cubic Cent.	density	NaCl in grams per liter	NaCl per 24 hours	Cl per liter	Cl per 24 hours	Beverages in Cubic Cent.
October 11.....	4,000	1,004	2.34	9.36			
October 13.....	2,100	1,008	3.97	8.33			
October 14.....	3,800	1,002	2.22	8.45			
October 20.....	2,250	1,006	3.15	7.08	1.91	4.29	1,750
October 21.....	3,250	1,005	2.92	9.49	1.77	5.75	2,750
October 24.....	3,500	1,011	3.04	10.64	1.84	6.44	2,750
October 25.....	3,250	1,009	3.51	10.40	2.13	6.92	

Diuresis would be higher than the beverages, but unfortunately it is impossible to trust the figures given by the patient since she refused to submit to a methodical surveillance in hospitalization conditions. The figures then are unreliable and for this reason we did not pursue the physiopathological study.

The hypophysis extract in a dose of 20 units under the skin reduced diuresis from 1 liter 500 to 1 liter 250, but on the third day it indicated digestive difficulties (stomach aches, cases of nausea). Her thirst was suppressed after pituitrin injection (20 units) administered at 8 o'clock, up until 18 hours, time at which she was keenly revived. The Aldrich McClure test is of sixty minute duration, therefore prolonged; let us add the fact that the radiograph of her sella turcica showed no anomaly; no sign of hereditary syphilis was discovered; in the blood, the reactions to the Bordet-Wassermann, Kahn and Hecht tests were negative. The patient rejected a lumbar tap.

To sum up, we saw developing in a twenty-two year old girl a considerable diabetes insipidus (18 liters a day) reacting perfectly to the hypophyseal extract and we saw an adipo-genital syndrome together with an increase in weight of 26 Kilograms one year after a cranial traumatism which bore on the right fronto-parietal region.

We shall not discuss here the etiology of the syndrome which appears to /119 be well post-traumatic, in spite of the time which elapsed between the traumatism and the appearance of the syndrome.

J. Lhermite made the necessary reservations on this point [2], with the trauma having been able to reveal latent anterior lesions of the infundibular region. It is logical to find fault in our observation with the development of a post-traumatic arachnoiditis, although the absence of

violent and persistent headache, of visual difficulties, is troubling. However that may be, the traumatism certainly determined important modifications in the hypothalamic centers, in the period of a year which preceded the diabetes insipidus not having been non-existent from a clinical point of view (extreme loss of appetite, irritability). Certain cases are comparable to our case, like those of H. Marx [3], because of the time elapsed between the traumatism and appearance of the diabetes.

In spite of the latent period, the post-traumatic source seems then to be exact, since no other infectious progress, either tumoral or syphilitic, could be detected.

We shall not insist any more on the physiopathological study which could only be summary, because the patient refused to lend herself to it.

We learned nothing of a very particular nature, except the slight elevation in the serine ration often discovered by us in diabetes globulin

insipidus cases. The verification of a normal figure for molecular concentration deserves to be remembered, in spite of the existence of thirst.

Urinary elimination of sodium chloride is exactly that of a normal subject. As in the case of the patient previously studied by us [4], an attack of infundibular syphilis, an irregularity in the metabolism of the lipides with hyperlipidemia can be put in evidence.

On the other hand, study of the symptom which dominates the whole pathological history of our patient: thirst, allows us to determine characteristics of this thirst many of which have been confirmed by ulterior clinical observation of other patients.

- 1st. The thirst started abruptly, at a given time prior to polyuria - a new example of polydipsic precession in diabetes insipidus.
- 2nd. The thirst was at first perceived as an irresistible need, the patient feeling that she was "driven" to drink.
- 3rd. This need was simultaneously accompanied by abnormal sensation in the whole upper part of the digestive tube (mouth, tongue, esophagus), together with the appearance of a feeling of dryness and constriction which does not correspond to a visible dessication of the mouth and tongue.
- 4th. The quantitative increase in ingestion was accompanied by qualitative gustatory modifications: loss of taste in water, necessity of exciting her taste by the addition of alcohol or with thermal modifications made on the water (heat or especially cold). /120
- 5th. Thirst was increased by ingestion of salt - the patient on her own adopted a slightly chlorinated diet - and to a lesser degree with heavily sugared foods.
- 6th. Thirst was regularly increased, in the hour which followed meals, to a considerable degree.

- 7th. Thirst diminished during the night.
- 8th. Privation of satisfying her need brought with it a state of agitation and of discomfort which brings to mind that of certain ones addicted to drugs at the time of weaning.

In the enumeration of these characteristics are to be found elements which can be discovered in every normal subject, such as the aggravating influence of salted and sugared foods (apart from all immediate gustative reflex), the influence of the meals and digestion, the suspensive action of sleep. On the contrary, the following are clearly pathological and characteristic of polydipsia in diabetes insipidus: need; abnormal sensation located in the upper digestive organs; the enormous quantitative increase in ingestion; the gustatory modifications noted at the peak of thirst.

It is remarkable to see these characteristics appear instantaneously and simultaneously. One can in effect say that the condition of polydipsia is due to the appearance of the feeling of dryness in the mouth; there is moreover no parallel between visible dessication and the subjective sensation.

Clinical analysis permits us to infer that everything takes place as if one had witnessed the sudden disorder in a nervous apparatus on which depended the reception of a particular visceral sensitiveness in the initial digestive organs.

Such facts do not agree with the theory which makes a primitive polyuria of diabetes insipidus. On the contrary they reveal this malady under new light as a disorder in the regulating apparatus, thirst, as the effect of a lesion in the hypothalamo-hypophysial region.

Now, very recent experiments happen to confirm this conception. Bellows and Van Wagenen [5], in dogs on which an oesophagotomy had been performed have in fact verified the predominant role of ingestion of water in diabetes insipidus, after experimental lesions of the tuber. This role is above all sensitive in the permanent variety of diabetes insipidus which appears slowly after the lesion; the same authors demonstrated on the other hand [6], that resection of the olfactory nerves, of the trigeminal nerve and of the gustatory nerves was without effect on the thirst, thus confirming the fact that the disorder is indeed of central origin; Swann [7, 8], confirmed polydipsic precession in the rat, as well as Richter [10], and they confirm the fact that sodium chloride has a constant aggravating action /121 on experimental diabetes insipidus, particularly in its permanent variety.

These preliminary observations ought to urge doctors and physiologists to more closely study the mechanism of thirst in man and the nature of its disorder in diabetes insipidus.

REFERENCES

1. See The Bulletin and Reports of the Medical Society of the Hospitals of Paris, 1941, page 718 and 1942 meetings of January 30, February 6, February 13, February 20 and February 27.
2. Lhermite, J., Metemer and Gauthier. Soc. Neurologie, 4 July 1935; in *Revue neurologique*, 64, p. 125, 1935.
3. Marx, H., *Nervenarzt*, 9, p. 297, 1936.
4. Kourilsky (Raoul and S.), M. Laudat and Jean Regaud. Physiopathological study of a case of diabetes insipidus. *Bull. et Mem. de la Soc. med des Hop. de Paris*, meeting on 30 January 1942.
5. Bellows and Van Wagenen. *The Journal of Nervous and Mental Disease*, 88, pp. 416, 473, 1938.
6. Bellows and Van Wagenen, *American Journal of Physiology*, 126, p. 13, May 1939.
7. Swann. *American Journal of Physiology*, June 1939.
8. Swann. *Endocrinology*, 25, p. 288, 1939.
9. Swann and Penner, *Endocrinology*, 24, p. 253, 1939.
10. Richter, *Brain*, 53, p. 76, 1930.

Translated for the National Aeronautics and Space Administration under Contract No. NASw-1695 by Techtran Corporation, PO Box 729, Glen Burnie, Md. 21061